



Department of Energy
Thomas Jefferson Site Office
12000 Jefferson Avenue
Newport News, Virginia 23606

May 15, 2008

Mr. Michael D. Dallas
Chief Operating Officer
Thomas Jefferson National Accelerator Facility
12000 Jefferson Avenue
Newport News, VA 23606

Dear Mr. Dallas:

2008 DOE FIRE PROTECTION ASSESSMENT

The attached assessment documents the Department of Energy's (DOE's) review of Jefferson Laboratory's Fire Protection program. This report has received a factual accuracy review from JLab and comments have been dispositioned. The assessment identified both Findings and Observations. For all Findings identified in the report, please submit to the Site Office a plan which addresses each corrective action's for each finding within forty five days of receipt of this letter. The plan shall include a description of actions taken and/or planned plus discussion of each Finding's cause(s). The causal factors of each finding should be the basis for development of the corrective actions. Findings against new contract requirements do not require causal analysis. For all Observations, please include in the plan the disposition and proposed course of action. Additionally, please notify the Site Office upon closure of each Finding. The lab may incorporate this plan into the compliance implementation action plan for DOE Order 420.1B, Facility Safety, provided that the compliance implementation action plan addresses all elements for effective management of corrective actions as noted above.

The Site Office understands that the Lab is currently transitioning from a Work Smart Standards set of requirements to full implementation of DOE Order 420.1B, Facility Safety. It is anticipated that this assessment will assist the lab in developing a more comprehensive program.

It is the Site Office intent to perform an effectiveness review to verify the successful closure of each finding and determine if the corrective actions for each finding have effectively resolved the causal factors to prevent recurrence.

If you have any questions pertaining to this assessment, please contact David Luke of my staff at extension 7139 or myself.

Sincerely,

A handwritten signature in black ink, appearing to read "Scott Mallette", is written over a horizontal line.

Scott Mallette, Deputy Site Manager
Thomas Jefferson Site Office

cc:

J. Turi	S. Neilson
S. Mallette	R. Korynta
W. Skinner	P. Hunt
J. Hudgens	D. Kausch
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B. Lenzer	

**U.S. Department of Energy
Thomas Jefferson Site Office**



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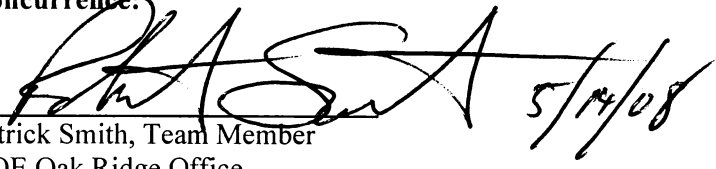
FINAL REPORT

**Fire Protection Program Assessment
of the
Thomas Jefferson National Accelerator
Facility**

May 2008

Approval

Concurrence:


Patrick Smith, Team Member
DOE Oak Ridge Office

Approval:



David Luke, Team Lead
DOE Thomas Jefferson Site Office

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Acronyms and Definitions

AHJ	Authority Having Jurisdiction
CEBAF	Continuous Electron Beam Accelerator Facility
CFR	Code of Federal Regulations
CRD	Contractor Requirements Document
DOE	U.S. Department of Energy
ES&H	Environment, Safety, and Health
FEL	Free-Electron Laser
FHA	Fire Hazards Analysis
FIND	Finding - Noncompliance with requirements (procedures, regulations, contract, etc.).
FSAD	Facility Safety Assessment Document
LINAC	Linear Accelerator
NFPA	National Fire Protection Association
NP	Noteworthy Practice - A positive statement that highlights good practices, well-written procedures, or other positive aspects of a program that could be used as a model for other similar programs across Jefferson Lab.
OBS	Observations are negative. An observation can be used to point out needed (but not required) program improvements. Observations also identify an isolated, minor, quick fix or nonadherence to best practices, internal procedures, or accepted standards.
TJNAF, Laboratory, or JLab	Thomas Jefferson National Accelerator Facility
TJSO	Thomas Jefferson Site Office

Executive Summary

The assessment of the Thomas Jefferson National Accelerator Facility (TJNAF, Laboratory, or JLab) found that the Fire Protection Program has not been implemented as required by Contract DE-AC-05-06OR23177, Section J, Appendix E, and that the current program does not satisfy all of the elements of the U.S. Department of Energy (DOE) Order 420.1B, *Facility Safety*. The assessment team noted that numerous program elements lack the maturity that would be expected at facilities of such importance to DOE.

Although DOE Order 420.1B, *Facility Safety*, was added to the JLab contract on January 24, 2008, the JLab Work Smart Standards set for fire protection was still in effect at the time of the assessment. Most findings in this assessment were associated with DOE Order 420.1B. The report lists these as findings and not observations because they are in fact contractual, as of the date of the assessment, and most importantly because they have the same level of importance as those findings against the (currently in use) JLab Work Smart Standards set of requirements. Correspondingly, DOE recognizes that the DOE Order 420.1B findings are a result of a change in program requirements.

DOE previously mandated two fire protection-related requirements with the JLab contract prior to the inclusion of DOE Order 420.1B. The requirements were (1) provide an annual summary of fire damages and (2) acknowledge the fire protection authority having jurisdiction designated by the DOE. JLab has not submitted an annual report of fire damages for the past several years. The assessment team also noted that (1) JLab has not implemented compensatory measures associated with a previously approved exemption, (2) the inspection, testing, and maintenance of fire barriers is not being performed, (3) JLab has not developed a phaseout plan for the current Halon-based fire suppression equipment, and (4) the safety management elements identified within the current facility assessment document are not being performed. Also during this assessment, the team noted several field discrepancies.

A comparison of the JLab Fire Protection Program to the requirements of DOE Order 420.1B indicated that several elements are missing from the existing program. These include performing program self-assessments, individual facility assessments, facility fire hazard analyses, a Fire Department baseline needs assessment, and revising the existing Hot Work Program.

The assessment team categorized noncompliances associated with the work smart standards contractual requirements and DOE Order 420.1B noncompliances as findings.

Findings

- FIND-001** Contrary to the requirements of Section J, Appendix E of Contract DE-AC05-06OR23177, JLab has not been providing an Annual Summary of Fire Damage.
- FIND-002** Contrary to the requirements of Section J, Appendix E of Contract DE-AC05-06OR23177, JLab has not implemented DOE compensatory controls required in an approved exemption to DOE Order 5480.7, *Fire Protection*.
- FIND-003** Contrary to the requirements of Section J, Appendix E of Contract DE-AC05-06OR23177, JLab has not established an inspection testing and maintenance program for facility fire barriers.
- FIND-004** Contrary to the requirements of the May 1993 DOE memorandum regarding the managed phaseout of Halon fixed-fire suppression systems, JLab has not established alternate fire protection configurations for the existing Halon fire suppression equipment.

- FIND-005** JLab has not maintained the safety management program element identified in the current Facility Safety Assessment Document (FSAD). The statements within the FSAD are not correct.
- FIND-006** Contrary to the applicable National Fire Protection Association codes and standards, JLab has numerous noncompliant field conditions related to fire protection and life safety requirements.
- FIND-007** Contrary to the requirements of DOE Order 420.1B, Attachment 2, “Contractor Requirements Document” (CRD), Chapter II, paragraph 3b(13), a documented, comprehensive fire protection program self-assessment has not been performed every three years.
- FIND-008** Contrary to the requirements of DOE Order 420.1B, Attachment 2, CRD, Chapter II, paragraph 3b(14), facility fire protection appraisals are not being performed every three years or on a schedule determined by DOE.
- FIND-009** Contrary to the requirements of DOE Order 420.1B, Attachment 2, CRD, Chapter II, paragraph 3b(5), fire hazard analyses are not being performed/reviewed at a frequency defined by the DOE Order.
- FIND-010** Contrary to the requirements of DOE Order 420.1B, Attachment 2, CRD, Chapter II, paragraph 3b(8), a Fire Department baseline needs assessment has not been completed and approved by the local Site Office.
- FIND-011** Contrary to the requirements of DOE Order 420.1B, Attachment 2, CRD, Chapter II, paragraph 3b(2)(g), a comprehensive hot work program has not been established.
- FIND-012** Contrary to the requirements of DOE Order 420.1B, Attachment 2, CRD, Chapter II, paragraph 3b(2)(f), written procedures for a fire-related impairment program are not in place.

**Final Report – Fire Protection Program Assessment
of the Thomas Jefferson National Accelerator Facility**

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) conducted an assessment to evaluate implementation of the DOE-required Fire Protection Program at the Thomas Jefferson National Accelerator Facility (TJNAF, Laboratory, or JLab). The assessment was performed March 17–20, 2008.

2.0 SCOPE

The assessment included a performance-based evaluation of the implementation of work practices, work controls, and selected management system elements. The specific scope elements verified that:

- (1) The site (or facility) is governed by an up-to-date, comprehensive, documented fire safety program as defined by DOE Order 420.1B, *Facility Safety*.
- (2) The fire and related hazards on site (or within the facilities) have been identified and evaluated in conjunction with a current and comprehensive fire hazards analysis (FHA) and Final Safety Analysis Document (FSAD)/Accelerator Safety Envelope.
- (3) Fire prevention procedures have been implemented, and fire safety features have been installed to mitigate the fire risks.
- (4) Fire protection and life safety features are being adequately maintained.
- (5) Personnel are appropriately qualified and trained to perform their work safely and responsibly when confronted by fire hazards and related dangers.
- (6) The site is protected by a fully capable emergency services organization.

The above scope was assessed by reviewing the implementation of applicable laboratory-wide policies, procedures, and management systems; subject area-specific DOE Orders, regulations, and contract-required standards; and organizational-specific standard operating procedures and safety basis documents.

3.0 CRITERIA

“Performance criteria” are defined as the requirement documents and standards that are applicable to the activity and scope being assessed. For the scope of this assessment, the performance criteria included the following:

- (1) Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart E, *Means of Egress*
- (2) 29 CFR 1910, Subpart L, *Fire Protection*
- (3) 29 CFR 1926, *Safety and Health Regulations for Construction*
- (4) DOE Order 420.1B, *Facility Safety*
- (5) DOE Standard 1066-99, *Fire Protection Design Criteria*
- (6) DOE Standard 1088-95, *Fire Protection for Relocatable Structures*
- (7) DOE Handbook 1062-96, *Fire Protection Handbook*
- (8) DOE Handbook 1081-94, *Primer on Spontaneous Heating and Pyrophoricity*
- (9) National Fire Protection Association (NFPA) codes and standards
- (10) Factory Mutual Loss Prevention Data Sheets

4.0 ASSESSMENT METHODS

The assessment was conducted in accordance with the approved review plan. The following sections contain details on the schedule and logistics and the conduct of the assessment.

4.1 Schedule and Logistics

The assessment was conducted March 18–20, 2008. The assessment team members and their affiliations are shown in the following table:

Name	Organization
David Luke	DOE Thomas Jefferson Site Office (TJSO)
Patrick Smith	DOE Oak Ridge Office

4.2 Conduct of the Assessment

The assessment was a performance-based assessment in that the team verified that the requirements are in place in JLab's procedures and adequately implemented in practice. The assessment approach included:

- Reviewing procedures, documents, and records.
- Interviewing line management, operations, and operations support personnel.
- Observing current work practices.

The assessment team categorized the issues identified during the assessment as findings (FIND), observations (OBS), or noteworthy practices (NP).

5.0 ASSESSMENT RESULTS

JLab has a Fire Protection Engineer on staff and retains the part-time services of contractor support personnel to assist with the inspection, testing, and maintenance of fire suppression equipment. During field inspections of the various facilities, the interactions between the respective facility managers and the Fire Protection Engineer were notable. The JLab Fire Protection Program includes a spectrum of fire protection and life safety-related controls and procedures. These include topics such as assessments and appraisals, welding and brazing, compressed gases, fire protection systems, safe egress, and fire safety for construction.

The assessment team's review of the contractual requirements identified the required compliance to 29 CFR 1910, 29 CFR 1926, applicable NFPA codes and standards, and two specific fire protection-related requirements. TJSO recently included DOE Order 420.1B in the JLab contract, and JLab has submitted an implementation plan to bring the facility into compliance with the Order requirements.

DOE identified two specific fire protection-related issues with the JLab contract prior to the inclusion of DOE Order 420.1B. The two specific fire protection requirements are (1) provide an annual summary of fire damages and (2) acknowledge the fire protection authority having jurisdiction (AHJ) designated by the DOE. The review found that JLab has not submitted an annual summary of fire damages for the past several years (**FIND-001**). During the assessment, the team also identified a DOE Headquarters-approved exemption to omit complete automatic sprinkler coverage within Experimental Halls A, B, and C. In lieu of the automatic suppression system, several compensatory control measures were required to provide the facilities with an adequate level of protection to mitigate the increased risk. It was found that JLab is not currently implementing all of the compensatory measures (**FIND-002**). A review of various fire barriers within the facility found that JLab has not developed a fire barrier inspection program (**FIND-003**). During the inspection of the experimental halls, the team noted several wheeled Halon fire

extinguishers available for use. In 1993, DOE issued a memorandum requiring the phaseout of Halon-based fire suppression systems. JLab has not established alternate fire protection configurations for the existing Halon fire suppression equipment as required by the memorandum (**FIND-004**). A review of the facility safety analysis found that several of the fire protection-related safety management elements are not being performed (**FIND-005**). During the assessment team's walkthroughs of the various JLab facilities, the team identified numerous deviations from the applicable national standards (**FIND-006**).

As part of this review, the JLab Fire Protection Program was assessed to the requirements of DOE Order 420.1B. The team found that numerous areas of improvement will be required for the facility fire protection program to be in compliance with the DOE Order. These include performing program self-assessments (**FIND-007**), performing individual facility assessments (**FIND-008**), completing the revisions of the facility FHAs (**FIND-009**), performing a Fire Department baseline needs assessment (**FIND-010**), increasing the rigor of the existing Hot Work Program (**FIND-011**), and developing a formal fire protection impairment program (**FIND-012**).

5.1 Findings

- **FIND-001:** Contrary to the requirements of Section J, Appendix E of Contract DE-AC-05-06OR23177, JLab has not been providing an Annual Summary of Fire Damage.

Discussion: DOE Order 231.1A, paragraph 5a(8), requires that an Annual Fire Protection Summary for the previous year's fire damage be submitted to the DOE fire protection AHJ on April 30 each year. DOE Manual 231.1-1, Appendix F, identifies the specific fire protection program elements that are to be covered in the report.

- **FIND-002:** Contrary to the requirements of Section J, Appendix E of Contract DE-AC-05-06OR23177, JLab has not implemented the DOE compensatory controls required in an approved exemption to DOE Order 5480.7.

Discussion: In 1991, DOE approved an exemption to DOE Order 5480.7, *Fire Protection*, regarding the omission of ceiling sprinkler protection system for the Experimental Halls and for the specific maximum allowable travel distance for egress of 300 feet in Experimental Hall A. The compensatory measures included (1) partial sprinkler systems designed to protect the perimeter of the interior of the hall and components of critical experimental equipment, (2) carbon dioxide fire suppression systems for water sensitive equipment, (3) sprinkler protection for cable trays, (4) a smoke removal system, (5) heat and smoke detection systems, and (6) proceduralized limits on fire hazards and combustible materials.

The DOE letter states, "If a fire were to occur, it would be detected by the smoke detection system in its formative stages. The proposed system has been demonstrated effective in this application. The fire department would be summoned along with the emergency response organization and would control the fire using manual fire fighting equipment. Pending arrival of the emergency response forces, the proposed partial sprinkler systems and carbon dioxide systems would actuate to control the fire, limit temperature rise and protect critical equipment. Therefore the absence of the ceiling-level protection is not considered significant from a fire safety and property protection standpoint."

The assessment team's review of the existing facility configuration found that numerous new equipment components have been added to the halls, but local fire sprinkler protection has not been installed to provide protection. A review of the facility FHA found that the document does not discuss the equipment; therefore, validation of the importance of the equipment and the need to protect it was not possible. The team noted that portions of the

originally installed fire sprinkler system beneath the Hadron Spectrometer in A Hall have been removed to facilitate equipment repair. The sprinkler piping was not replaced on completion of the activity. The team's review of the carbon dioxide systems found that they have not been installed as identified within the contractor's exemption submittal. JLab's intent was to provide carbon dioxide systems for the detector huts, and an Inergen fire suppression system was installed in the detector hut in A Hall. However, the C Hall hut was never provided with a fire suppression system, although it was recommended within the facility FHA. The detector hut was provided with a smoke detection system. An inspection of accessible cable trays found that sprinkler protection was not evident. The team's review of the facility FHA found that the subject is not addressed. During a brief review of the smoke removal systems within the halls, the team found little information regarding the systems' capabilities and use to support egress and firefighting activities within the facility FHA. The team's review validated the installation of both heat and smoke detection systems. The proceduralized limits regarding fire hazards and combustible material were not validated during this review.

- **FIND-003:** Contrary to the requirements of Section J, Appendix E of Contract DE-AC-05-06OR23177, JLab has not established an inspection testing and maintenance program for facility fire barriers.

Discussion: Fire barriers are required to be installed per minimum national codes such as the NFPA 101 Life Safety Code to provide separation of egress pathways to general occupancy hazards. In addition, other minimum national standards require separation of various occupancies based on the hazards that they present. Numerous fire barriers exist within JLab facilities that are not being inspected at the minimum required frequencies. The team noted field deficiencies during the facility walkdowns and a review of previously conducted assessment reports.

- **FIND-004:** Contrary to the requirements of the May 1993 DOE memorandum regarding the managed phaseout of Halon fixed-fire suppression systems, JLab has not established alternate fire protection configurations for the existing Halon fire suppression systems.

Discussion: DOE issued a Memorandum in May 1993 regarding the managed phaseout of Halon fixed fire suppression systems. This was based on the concerns over environmental deterioration caused by the proliferation of chlorofluorocarbons and Halon compounds in the atmosphere. As part of the memorandum, it was stated that alternate fire protection configurations should be pursued in lieu of Halon fire protection systems. During the review, the team found no indications that funding requests were being considered to replace the existing Halon units. Two of the wheeled units were found to have exceeded their required hydrostatic test date and should be immediately removed from service.

- **FIND-005:** JLab has not maintained a safety management program element identified in the current FSAD. The statements in the FSAD are not correct.

Discussion: The FSAD states that independent highly-protected risk reviews are conducted biennially. According to the facility Fire Protection Engineer, the assessments were last performed in 2002. The FSAD states that the halls are fully protected by automatic fire sprinklers. The halls have been provided with partial sprinkler protection. There is no technical basis in the FSAD or FHA for the assigned consequence and probability ratings. A fire in the halls should be expected within the life of the facility based on its use of combustible components, high energy sources, and the nature of the operations. The consequences of a fire could be conservatively calculated as high, based on the known effects of the products of combustion on electronic equipment.

- **FIND-006:** Contrary to the requirements of applicable NFPA codes and standards, JLab has numerous noncompliant field conditions related to fire protection and life safety requirements. The deficiencies noted by the team were as follows:
 - Sprinkler protection is obstructed in the tunnel in several locations.
 - Ceiling panels are missing to the point of invalidating the safety function of sprinkler due to its ability to maintain the heat generated in a fire condition.
 - No as-built fire suppression system drawings exist for the automatic fire sprinkler systems; therefore, the sprinkler system design basis cannot be validated.
 - The access stairwells to the tunnel are used as part of the smoke removal system without an exemption of equivalency from the NFPA Life Safety Code.
 - Sticky notes are posted in various locations to identify emergency lights that failed to function during a previous power outage.
 - A number of sprinkler risers in tunnel exit stairways are not provided with sleeves, causing the concrete to be poured tight to the pipe and increasing the probability of pipe failure during a seismic event.
 - Sprinkler piping is encased in the concrete in truck ramps' roofs, eliminating its access and increasing its failure potential in a seismic event.
 - Nonrated fire doors are installed in rated fire walls in the Continuous Electron Beam Accelerator Facility (CEBAF) Center.

- **FIND-007:** Contrary to the requirements of DOE Order 420.1B, Attachment 2, "Contractor Requirements Document" (CRD), Chapter II, paragraph 3b(13), a documented, comprehensive fire protection program self-assessment has not been performed every three years.

Discussion: JLab was unable to provide evidence that a comprehensive self-assessment has previously been performed for the JLab Fire Protection Program. Fire protection program self-assessments are required to be performed to validate that DOE-owned and leased facilities/activities are being provided with a level of protection that meets the "highly protected risk" elements used by general industry. DOE has chosen to meet the highly protected risk requirements based on the fact that DOE facilities are not insured against loss and because of their unique nature.

- **FIND-008:** Contrary to the requirements of DOE Order 420.1B, Attachment 2, CRD, Chapter II, paragraph 3b(14), facility fire protection appraisals are not being performed every three years or on a schedule determined by DOE.

Discussion: The TJSO has not established a frequency schedule for the facility assessments. The JLab Environment, Safety, and Health (ES&H) Manual, Chapter 6910, Appendix T4, requires facility fire protection appraisals to be performed every one, two, or three years based on the dollar value of the facility. The JLab current facility assessment process is generic in nature and does not address the DOE Order requirements. DOE requires that individual facilities of importance be reviewed against identified criteria to ascertain that the appropriate level of protection is being applied to the facility based on its importance to DOE.

- **FIND-009:** Contrary to the requirements of DOE Order 420.1B, Attachment 2, CRD, Chapter II, paragraph 3b(5), FHAs are not being performed/reviewed at a frequency defined by the DOE Order.

Discussion: Contrary to the requirements of DOE Order 420.1B, Attachment 2, CRD, Chapter II, paragraph 3b(5), FHAs have not been performed/reviewed at the frequency required by the Order. While JLab has several FHAs, they have not been revised at the

required frequencies required by the Order, and they no longer reflect the actual facility configurations (hose stations removed in the tunnel and acid stations have been added to the test laboratories). A review of the Experimental Hall B found the FHA to be fairly comprehensive in nature, although numerous elements of the information were found to be out of date. In general, the documents do not reflect the current facility dollar values or the facility point hazards, and they do not address the effects of combustion products on the electronic equipment in the various facilities.

- **FIND-010:** Contrary to the requirements of DOE Order 420.1B, Attachment 2, CRD, Chapter II, paragraph 3b(8), a Fire Department baseline needs assessment has not been completed and approved by TJSO.

Discussion: The purpose of a baseline needs assessment is to validate that the fire, emergency medical, and rescue response capabilities of the responding fire department provide an adequate level of service based on the importance and hazards of the facility. JLab receives these services from the City of Newport News. Three fire stations are in close proximity to the facility. The stations are 1.2, 1.8, and 3.8 miles away. During this assessment, it was reported that the Fire Department would not make an aggressive fire attack within any of the Experimental Halls. As such, due to the lack of automatic fire suppression and manual suppression capabilities, DOE can expect a high dollar loss potential. It should be noted that the exemption approved in 1993 by DOE Headquarters expected manual suppression activities to be conducted to minimize the fire loss potential.

- **FIND-011:** Contrary to the requirements of DOE Order 420.1B, Attachment 2, CRD, Chapter II, paragraph 3b(2)(g), a comprehensive hot work program has not been established.

Discussion: The assessment team determined that the JLab Hot Work Program lacks sufficient structure and controls to meet the highly protected risk requirements for protection against fire. The team identified the following issues and discussed them with JLab personnel:

- The JLab Hot Work Program procedure allows a Facility Manager to appoint anyone as a recognized “primary authorizing official” without any formal training requirements or required detailed hazard analysis capabilities.
- Fire watch personnel are not required to be assigned for the protection of the worker; only property protection concerns are addressed.
- **FIND-012:** Contrary to the requirements of DOE Order 420.1B, Attachment 2, CRD, Chapter II, paragraph 3b(2)(d), the contractor has not established comprehensive fire protection criteria and procedures regarding the operability, inspection, maintenance, and testing of the fire protection systems and features.

Discussion: During the assessment, the team noted that the identification, inspection, maintenance, and testing of fire barriers (walls, doors, dampers) are not being performed. Fire barriers are required to be installed to separate various occupancy hazards for both property protection and life safety.

5.2 Observations

No OBSs were identified.

5.3 Noteworthy Practices

No NPs were identified.

6.0 CONCLUSION

The JLab Fire Protection Program is not meeting all of the fire protection program requirements established in DOE Order 420.1B.

APPENDIX A

Records Reviewed

- Letter from James A. Turi to John R. Sprouse, *National Fire Protection Association (NFPA) 101 Equivalency Approval*, dated February 4, 2008
- Exemption Request, CEBAF Experimental Halls A. B. and C., Project No. 87-R, dated August 22, 1990:
 - Page 3, 1.d. *CO₂ suppression systems for electronic equipment and other water sensitive equipment in enclosed areas (e.g., the detector hut).*
 - Page 5, 3.c. *Fire prevention and suppression training (including hand-held extinguisher use) will be provided to Experimental Hall personnel.*
 - Page 5, 3.d. *Transient packing material combustibles will be kept to a maximum of 20 pounds in each of the halls and removed on a daily basis.*
- Letter from K. Dean Helms to Dr. Ron Sundelin, *CEBAF Fire Hazard Analysis (FHA)*, dated January 9, 1995
- Search results for issues, Jefferson Lab, AQIS/CATS, Anthony Takacs Open Issues, dated March 20, 2008
- E-mail William.robinson@hillersystemsinc.com to kausich@jlab.org, riesbeck@jlab.org, and joey.doxey@hillersystemsinc.com, *Weekly Work Plan*, dated January 14, 2008
- Report, *Jefferson Lab Highly Protected Risk Evaluation for Thomas Jefferson National Accelerator Facility Southeastern Universities Research Association*, dated August 12, 2004
- Data from Facilities Information Management System, *Y Number, Property Name, Buildings – Owned*, no date
- Letter from Kenneth L Jones, Newport News Fire Department, to Carter B. Ficklen, Jefferson Lab, *As the new Fire Chief of Newport News, I am writing to assure you that our response priority to your facility will not change*, dated September 27, 2001
- Report, *Jefferson Lab Highly Protected Risk Evaluation for Thomas Jefferson National Accelerator Facility Southeastern Universities Research Association*, dated July 10, 2002
- Thomas Jefferson National Accelerator Facility, *2002 Free-Electron Laser (FEL) Operations and Safety Envelopes*, submitted by Fred Dylia, FEL Program Manager, concurred by Andrew Hutton, Department Head, Accelerator Operations and Charles Reece, Accelerator Division EH&S Officer, Approved by James Murphy, Director, Office of Assessment, dated December 12, 2002
- Memorandum, from Neal Goldenberg and Joseph Fitzgerald, Jr., to Distribution, *Managed Phase Out of Halon Fixed Fire Suppression Systems*, dated May 5, 1993
- Letter from Christoph Leemann to James A. Turi, *DOE Order 226.1A and Order 420.2B Implementation*, dated March 7, 2008
- Letter from James A. Turi to Michael D. Dallas, *Modification M034, Contract No. DE-AC-05-06OR23177*, dated January 24, 2008
- Letter Michael Dallas to James A. Turi, *Revision of Section J, Appendix E*, dated December 10, 2007
- Jefferson Lab, ES&H Manual, Document Author Dave Kausch, *6910 Appendix T4 Fire Protection Program Assessment and Appraisal*, April 19, 2002
- Jefferson Lab, ES&H Manual, Document Author: Dave Kausch, *6910 Appendix T5 Laboratory Facility Fire Safety Features Overview*, dated April 19, 2002
- Jefferson Lab, ES&H Manual, Document Author: Dave Kausch, *6910 Fire Protection Program*, dated April 19, 2002
- Jefferson Lab, ES&H Manual, Document Author: Dave Kausch, *6910 Appendix T3 Fire Protection Aspects of Planning and Property Acquisition*, dated April 19, 2002
- Jefferson Lab, ES&H Manual, Document Author: Dave Kausch, *6910 Appendix T2 Inspection, Testing, and Maintenance of Fire Protection Systems*, dated April 19, 2008

- Jefferson Lab, ES&H Manual, Document Author: Rusty Sprouse, *6950 Fire Safety Construction Requirements*, dated April 19, 2002
- Jefferson Lab, ES&H Manual, Document Author: Christine Snetter, *6920 Appendix T1 Building Evacuation Procedure*, dated May 3, 2005
- Jefferson Lab, ES&H Manual, Document Author: Christine Snetter, *6920 Appendix T2 Evacuation Drill*, dated May 3, 2005
- Jefferson Lab, ES&H Manual, Document Author: Christine Snetter, *6920 Safe Egress*, dated May 3, 2005
- Thomas Jefferson National Accelerator Facility Final Safety Assessment Document, Recommended by: Swapna Chattopadhyay and Lawrence Cardman and Approved by: Christoph W. Leemann, dated: Revision 4 – April 5, 1994 and Revision 5 – November 2002
- Jefferson Lab, ES&H Manual, 6122-T1 Welding Arc Damage, *Appendix 6122-T1 Prevention of Skin and Eye Damage from Welding Arcs*, May 25, 2007
- Jefferson Lab, ES&H Manual, 6122-T4 Respiratory Health and Welding, *Appendix 6122-T4 Respiratory Health Effects Due to Inhalation of Fumes and Welding By-Products*, dated May 25, 2007
- Jefferson Lab, ES&H Manual, 6122-T2 Use of Fire-Haz Work Permits, *Appendix 6122-T2 Fire Protection: Use of Fire Hazard Work Permits*, dated May 25, 2007
- Jefferson Lab, ES&H Manual, 6122-T3 Shock and Hazard Prevention, *Appendix 6122-T3 Electrical Shock and Physical Hazard Prevention*, May 25, 2007
- Jefferson Lab, ES&H Manual, Document Author: Dave Kausch, *6930 Fire Protection Systems*, dated April 19, 2002
- Jefferson Lab, ES&H Manual, Document Author: Rusty Sprouse, *6950 Appendix T1 Portable Structure Relocation Worksheet*, dated April 19, 2002
- Jefferson Lab, ES&H Manual, 6122-T5 Compressed Gases in Welding, *Appendix 6122-T5 Control of Physical Hazards Associated with Use of Compressed Gases in Welding*, dated May 25, 2007
- Jefferson Lab, ES&H Manual, Document Author: Kelly Dixon, *6122 Appendix T6 Welding and Brazing Program*, February 29, 2008
- Jefferson Lab, ES&H Manual, 6152-T2 Liquefied Petroleum Gases, *Appendix 6152-T2 Standard for the Storage and Handling of Liquefied Petroleum Gases*, dated January 26, 2005
- Jefferson Lab, ES&H Manual, 2410-T2 Work Smart Standards Set, *Appendix 2410-T2 TJNAF Work Smart Standards Set*, dated April 21, 2006
- Jefferson Lab, ES&H Manual, 6150 Compressed Gases, *Compressed Gases*, dated February 1, 2006
- Jefferson Lab, ES&H Manual, 6152 Storage/Use of Flammable Gases, *Storage and Use of Flammable Gases for Experiments at Jefferson Lab*, dated January 26, 2005
- Jefferson Lab, ES&H Manual, 6152-T1 Gas System Classification, *Appendix 6152-T1 Examples of Gas System Class Determination*, dated January 26, 2005
- Jefferson Lab, ES&H Manual, *Appendix 6152-R1 Flammability Limits*, dated January 26, 2005
- Jefferson Lab, ES&H Manual, *Appendix 6152-R2 Heats of Combustion*, dated January 26, 2005
- Jefferson Lab, ES&H Manual, Document Author: Dave Kausch, *6910 Appendix T1 Building Fire Protection Design*, dated April 19, 2002
- *Technical Proposal* offered by Hiller Systems Inc., RFP SURA-01-R113, *Inspection, Testing and Maintenance Fire Protection Systems*, Prepared for Jefferson Lab, no date

Interviews Conducted

- JLab - Fire Protection Engineer
- JLab - Fire & Security Technician William Robinson - Hiller Systems Inc - Lead Technician
- JLab - Hall A Coordinator
- JLab - Director Facilities Management & Logistics
- JLab - Safety Engineer (2)

- JLab - Acting Director ESH&Q
- Hiller Systems Inc - Assistant Technician

Activity Observations

During the review of the LBNL Fire Protection Program, the assessment team visited the following facilities:

- Experimental Hall A
- Experimental Hall B
- Experimental Hall C
- North Linear Accelerator (LINAC)
- South LINAC
- Machine Control Center
- Machine Control Center Annex
- Bean Switch Yard
- Free Electron Laser Facility
- Test Lab
- Experimental Equipment Lab
- Continuous Electron Beam Accelerator Facility Center